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## SURVEY ON PATTERN OF SNAKE BITE CASES ADMITTED IN SOUTH INDIAN TERTIARY CARE HOSPITALS

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**ABSTRACT: Background:** Snake bite is a problem across the developing countries, where agriculture is one of the main sources of income and India is one among it. **Objective:** The study was carried out to determine the pattern of snake bite in four different selected tertiary care hospitals of south India for a period of 03 years from March 2011 to March 2014. **Material and Methods:** A prospective observational study of 270 patients of snake bite was collected in patients admitted to emergency department in four different selected tertiary care hospitals in south India. Patients with history of previous visit for treatment before admitting into the study sites were excluded from the study. **Results:** There were 201 males [74.4%] and 69 females [25.5%] out of 270 snakebite patients in our study. Of that, 142 [52.6%] patients were between the age group of 30-50 years. Most of the cases were farmers [56.66%] and Laborers [32.96%]. Peak incidence of snake bite was observed during rainy season [68.8%]. Most of the envenomation had reported between 6pm to 6am [64.44%]. Bite was most commonly seen in the lower extremities [65.17%], with local pain and cellulites being common complication. About 52.22% of patients required 11-20 vials of ASV during the treatment. Recovery rate was 84.44% with 10% mortality during our study period. **Conclusion:** Snake bite is one among the most neglected public health problem in developing countries. Researchers should always look at decreasing the morbidity and mortality, in turn improving the quality of life of the patient.

**INTRODUCTION:** Venomous snakebites continue to cause great morbidity and mortality in the developing country. Annual incidence rates may vary according to geographical regions. On an average annually nearly 2,00,000 persons are bitten by snake worldwide and 60,000-70,000 of them dies because of complication following snakebite. <sup>1-5</sup> It is been estimated that, India is recognised as having the highest snakebite mortality in the world.

World Health Organization survey reports that 1.2-2.4 deaths occur per 100,000 victims with a mortality level of 25,000 per annum. <sup>6-8</sup> Snakebites are mostly encountered in rural areas and this linked with environmental and occupational conditions. It is considered to be an underestimated and neglected public health issue responsible for substantial illness and death which affects the socioeconomic status in the developing countries. <sup>9, 10</sup> It is one of the most important and serious medical problem in many parts of India.

The true global incidence of envenomation and its severity remain largely misunderstood. Hospital records fall far short of the actual number of snakebite cases, owing to depend on the traditional

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healers and practitioners. It has been reported that in most developing countries, up to 80% of individuals bitten by snakes first consult traditional practitioners before visiting a medical center. These victims may die at home and their deaths remain unrecorded.<sup>11-13</sup> Hence, there is no reliable epidemiological data about the morbidity and mortality available since there is no proper reporting system related to snakebites.<sup>11-14</sup>

Of the 3,000 snake species across the globe, about 600 are venomous and considered dangerous to humans.<sup>15</sup> Morbidity and mortality from snake bite envenomation depends on the species of snake, since the estimated fatal dose of venom varies among species. There are about 236 species of snakes in India. Most of them are non venomous and are dry bites, apart from causing panic reaction and local injury, which do not harm the patients. There are 15 varieties of venomous snakes, among them, the cobras, the Russell's viper, the saw scaled vipers and the kraits are the most common seen in India.<sup>4</sup>

Snakebites lead to various clinical pictures, depending on the snake species involved and the envenomation severity.<sup>16, 17</sup> Snake venom contains protein enzymes, which may be divided into three groups: cytotoxic [Viperidae], neurotoxic [Elapidae] and haemotoxic [colubridae] venoms. The cytotoxic effect leads to local pain, edema and tissue necrosis with possible coagulopathy, hypovolemic shock, renal failure and death. The neurotoxic outcome consists of somnolence, visual disorders and respiratory distress. The hematological toxicity can manifest through bleeding that may develop into disseminated intravascular coagulopathy. In bites by poisonous and non-poisonous snakes, anxiety is a predominant manifestation. Non poisonous snake bites may also leave puncture marks and swelling at the site of bite.<sup>18</sup>

The only specific antidote for snake bite is administration of Anti Snake Venom [ASV] with or without adjunctive treatment as necessary in each case. Incidence of complication is directly proportional to the duration of venom in the blood prior to neutralization by ASV due to late arrival of patient at hospital.<sup>19, 20</sup> Antivenom may be species

specific [monovalent] or effective against several species [polyvalent]. Monovalent antivenom is ideal, but the cost and non availability, besides the difficulty of identifying the snakes makes its use difficult. Availability of antivenom at primary health care centre's and rapid transportation facilities may change the morbidity associate with snake bite. Early administration of the polyvalent antivenom has reduced morbidity and mortality but is associated with anaphylaxis in small group of patients. There is need to educate the rural population about the hazards and treatment of snake bite.

### **MATERIALS AND METHODS:**

A prospective, observational study was carried out on 270 patients of snake bite and unknown bite admitted to emergency department at four different tertiary care hospitals in and outskirts of Bengaluru. The study was approved by the Institutional ethical committee of the respective hospital to collect the necessary data for completing the study. The snake bite victims, who attended the emergency department from March 2011 till March 2014, were recruited into our study, excluding the patients with the history of previous visit for the treatment before admitting to the selected study site. The relevant details were entered into a well designed data collection form, which recorded demographic details, season of bite, place of bite, clinical features and complications, details of the specific treatment which was received and the outcome of the snake bite victims were recorded and analyzed.

### **RESULTS:**

A total number of 270 patients with snake bite admitted to emergency department were recruited between March 2011 to March 2014 in four different selected tertiary care hospitals. The collected data was reviewed and analyzed.

Snake bite was most commonly reported in the age group 30-39 years with 83 patients [30.74%], followed by the 40-49 years age group of 59 patients [21.85%], followed by more than 50 years aged patients of 46 victims [17.03%] [ **Table 1**]. We observed that males patients 201[74.44%] were more prevalent than females patients, 69 [25.55%] **Table 1**. The majority of snake bites were reported from rural area with 214 patients [79.25%],

compared to urban area with 56 patients [20.75%] **Table 2.** We also summarized with our data that, farmers of 153 patients [56.66%] are the major group of occupational population who were envenomed, followed by laborers with 89 patients [32.96%] and other group of population like, snake catchers, charmers, accidental attacks, etc with 28 patients [10.38%] **Table 2.**

Most snake bite was seen during rainy season with 186 patients [68.8%] followed by 66 patients [24.4%] during winter and 18 patients [6.8%] in summer [Table 2]. Victims in our study were bitten outdoors mostly in the field during the night time between 6pm to 6am with 174 patients [64.44%] followed by 6am to 6pm of 96 patients [35.55%] **Table 2.**

**TABLE 1: DISTRIBUTION OF AGE AND SEX:**

Age group [in yrs]	No. of Male Patients	No. of Female Patients	No. of patients [N=270]	Percentage[%]
< 10	12	02	14	05.18
10-19	24	03	27	10.00
20-29	26	15	41	15.10
30-39	58	25	83	30.74
40-49	47	12	59	21.85
> 50	34	12	46	17.03
<b>Total</b>	<b>201</b>	<b>69</b>	<b>270</b>	<b>99.99</b>

**TABLE 2: EPIDEMIOLOGY FACTOR IN SNAKE BITE CASES:**

Factors	No. of Patients [N=270] [%]
<b>Place:</b>	
Rural	214 [79.25%]
Urban	56 [20.75%]
<b>Occupation:</b>	
Farmers	153 [56.66%]
Laborers	89 [32.96%]
Others	28 [10.38%]
<b>Season of bite:</b>	
Rainy	186 [68.8%]
Winter	66 [24.4%]
Summer	18 [6.8%]
<b>Time of Bite:</b>	
6pm- 6am	174[64.44%]
6am-6pm	96 [35.55%]

The most common bitten site was in the lower extremities [65.17%] of which left lower limb was reported to be bitten more in 98 patients [36.29%] than right lower limb with 78 patients [28.88%] **Table 3.** There were also reports of bitten sites in upper extremities [30%] with left upper limbs reported to be more in 45 patients [16.66%] followed by right upper limb with 36 patients [13.33%]. About 13 patients [4.81%] reported to be bitten on the chest, backside of the neck, shoulder **Table 3.**

The envenomed patients developed major incidence of complications such as local pain [256 patients], cellulites [253 patients], coagulopathy [74 patients], Hematoxicity [68 patients], edema

[48 patients], Acute renal failure [48 patients] and neurotoxicity [35 patients]. Fewer incidences of complications such as ulcer of limb [17 patients], respiratory failure [14 patients], Iron deficiency anemia [14 patients] and chronic renal failure [13 patients] were also documented **Table 4.** We found that most of patients had incidence of multiple complications.

**TABLE 3: DISTRIBUTION OF CASES AS PER SITE OF BITE:**

Place of bite	No. of patients [N=270]	Percentage [%]
Right upper limb	36	13.33
Left upper limb	45	16.66
Right lower limb	78	28.88
Left lower limb	98	36.29
Others	13	4.81
<b>Total</b>	<b>270</b>	<b>99.97</b>

**TABLE 4: COMPLICATION DUE TO SNAKE BITE:**

Complications	No. of patients
Local pain	256
Cellulites	253
Coagulopathy	74
Hematoxicity	68
Edema	54
Acute Renal Failure	48
Neurotoxicity	35
Ulcers of limb	17
Respiratory failure	14
Iron Deficiency Anemia	14
Chronic Renal Failure	13
Septicemia	09
Pulmonary Edema	06
Cutaneous abscess	06
Cerebrovascular Accident	04

All the admitted patients received tetanus toxoid on admission to the study sites. Polyvalent AVS was the only line of treatment to combat the snake envenomation. Apart from treating ASV's rest all were given as a symptomatic treatment. 263 patients [97.4%] received polyvalent ASV of which 141 patients [52.22%] received between 11-20 vials individually, followed by 95 patients [35.18%] received more than 20 vials individually and only 28 patients [10.37%] received less than 10 vials during their whole course of treatment till they recovered from their complication **Table 5**.

No vials of ASVs were used in 06 patients [2.22%] who did not get into complications, due to mild envenomation **Table 5**. The ASV preparation used was lyophilized powder which was recommended to reconstitute with water for injection and given as intravenous infusion in 5% dextrose or normal saline.

**TABLE 5: NUMBER OF ANTISNAKE VENOM VIALS GIVEN FOR SNAKE BITE VICTIMS:**

No. of Vials	No. of patients [n=270]	Percentage [%]
< 10	28	10.37
11-20	141	52.22
>21	95	35.18
None	06	2.22
<b>Total</b>	<b>270</b>	<b>99.99</b>

About 228 patients [84.44%] got discharged with medication to be continued at home with an advice to review after 15 days to outpatient department of medicine. 27 patients [10%] had mortality, due to multi organ failure, respiratory collapse, and cardiotoxicity with sever renal failure during the course of treatment. 15 patients [5.55%] **Table 6** were taken against medical advice, due to reasons like affordability of hospital expenses, chances of recovery and shifting to hospital near to their residence, if it is just for post treatment observation.

**TABLE 6: OUTCOME OF SNAKE BITE VICTIMS:**

Outcomes of patients	No. of patients [n=270]	Percentage [%]
Discharged	228	84.44
Death	27	10.00
Discharged against Medical Advise	15	05.55
<b>Total</b>	<b>270</b>	<b>99.99</b>

**DISCUSSION:** Snakebite remains an important cause of accidental death in modern India and its public health importance has been systematically underestimated. From our study, predominantly the adult population was the victim of envenomation with age between 30-39 years followed by 40-49 years, probably due to their occupational hazard, which correlated with other studies.<sup>21-25</sup> We observed that males were more often exposed than females, as they are dominant earning members of the family who are actively engaged in farming, working outdoors and sleeping in the farm yards during harvesting and employments. But, in controversy to our study, female preponderance has been observed in a study done at Shivalik Himalayan region, where women in hills are involved in cutting grass for fodder more frequently.<sup>26</sup>

From our reports, we observed that majority of the population who were bitten by snake were from the rural areas, which are justified by the previous studies conducted on the prevalence of snake bite in different parts of the world,<sup>27, 28</sup> because most of the developing countries, agriculture and working in the field are main source of income and occupation. Hence farmers and laborer class of population are most victimized by snake bite, due to easy contact with the snakes.<sup>8, 29-31</sup> Increase in number of snake bite cases is seen during the monsoon season when there is rainfall and increase in harvesting activities in the field.<sup>8, 9, 28, 32, 33</sup> The time of bite corresponds to the outdoor activities, like going to the field for water harvesting, sleeping outside the house on the floor due to more number of person staying in a small house or to combat the heat during summer, passing urine and stool in an open field, commuting to the nearest place with barefoot without light, which makes more prone for snake bites.<sup>26, 27, 34</sup>

Study concludes that majority of the snake bite involved the lower extremities as it is been more exposed sites of the body due to people work in the plantations, wood collections, gardening with bare-footed, particularly in rural areas covering major percentage of population which confirms with other previous studies.<sup>27, 35-37</sup> Among the vasculotoxic snake bites, local pain and swelling with cellulites was the main manifestations observed, which was

in contrast with other studies, where they was found that bleeding was the main manifestation. Acute renal failure and neurotoxicity were also been commonly reported in others studies including hematuria and respiratory failure. It is been reported in India that, the incidence of acute renal failure is 13-32%.<sup>38-41</sup>

Antivenom is the only specific antidote treatment available for snake bite envenomation. The available product covers only the "Big 4" species. Early administration of antivenom is always proved beneficial in preventing complications and morbidity, decrease in the number of vials used during the treatment, decrease in the incidence of anaphylaxis due to antivenom, which all in turn reduces the cost of the treatment.<sup>28, 29, 39</sup>

We observed in our study that, during the course of treatment maximum numbers of patients were used with 11-20 vials of anti snake venom, which contradicted with a study research. They observed that maximum number of patients was given with more than 20 vials of ASV.<sup>42</sup> Outcome of the patients is directly related to the time of exposure for a snake bite to the time of arrival into the hospital, applying the first aid like immobilization on to the bitten area and timely administration of antivenom. Reports of morbidity and mortality depend on the lack of awareness in the community due to snake bite, lack of availability of anti snake venom, lack of transportation and inability to afford transportation. The death rate in our study was 10%, which compares well with the other studies with 3%-10% mortality across India.<sup>43, 44, 45</sup>

Awareness and knowledge regarding prevention of snake bite envenomation should be disseminated to farmers and field workers. They should be clearly advised not to catch snake without proper equipments. Encourage them to wear ankle cover boots while in the field, use torch lights while commuting at night, clear the unused wood logs or any other materials, which can make the snake habitat. Educate not to sleep outdoor, especially on the floors during summer. Discourage them for the first-aid measures such as incision, suction and herbal treatment, which results in loss of vital time in seeking medical attention.

**CONCLUSION:** There is an urgent need to educate the rural population about the hazards of envenomation and to promote public health policies directed to improve the treatment and prevention of snake bite. It is also very important to train and educate the non medical staff to handle the snakebite victims when arrived at emergency department. An essential step should be taken towards establishing a snake museum, which will help in identifying the type of snake, which has bitten the patient, promoting the best treatment.

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